

**Amendments to the Specification:**

Please replace paragraph [009] with the following amended paragraph:

**[009]** In accordance with another aspect of the invention, a method of applying a coating to a titanium-based substrate ~~comprising~~ comprises applying an aluminum conversion layer of between about 2 to 12 microns on the substrate by gaseous deposition, the layer being deposited at a temperature below which aluminum does not appreciably react with titanium and below the melting point of [[ Al ]] aluminum; heat treating the aluminum conversion layer so the aluminum oxidizes to form alumina and interacts with the titanium to form the titanium aluminide; and the aluminum conversion layer is oxidized to form an alumina surface layer.

Please replace paragraph [012] with the following amended paragraph:

**[012]** In accordance with yet another aspect of the invention, a method of applying a coating to a braze for titanium, which may contain depending on the braze alloy a substantial amount of Ti, only trace amounts of Ti, or in some cases no Ti, ~~comprising~~ comprises applying an aluminum conversion layer of between about 2 to 12 microns on the substrate preferably by gaseous deposition, the layer being deposited at a temperature below which aluminum does not appreciably react with titanium or the braze and below the melting point of Al; heat treating the aluminum conversion layer so the aluminum oxidizes to form alumina and interacts with the braze either to form the titanium aluminide or a solid state solution diffusing into the braze leaving an alumina surface layer.

Please replace paragraph [031] with the following amended paragraph:

[031] Elevated temperature protection against oxidation is required for titanium alloys to be used at high temperatures. An excellent TiAl protective coating was described in ~~Serial No. 09/874,564, filed June 5, 2004~~ U. S. Patent No. 6,670,050, issued on December 30, 2003, assigned to the same assignee as the present invention, but as with nearly all coatings there is a reduction in fatigue life associated with it (i.e., fatigue debit).

Please replace paragraph [035] with the following amended paragraph:

[035] Titanium foil 4 mil thick was selected for an evaluation of coating thickness because the effect of the coatings properties is much more pronounced on the thin foil than thick sections. Thin foil is also required for heat exchangers, with it being formed into the fins. The foil was machined to tensile and fatigue specimens with care being taken not to damage the edges of the foil. These were then degreased prior to being coated with aluminum of various thicknesses. The vapor deposition technique was chosen to deposit the aluminum and a deposition temperature of 300°C was used. The coating thickness of the aluminum conversion layer was varied from 5 to 40 microns by adjusting the specimen locations within the coating chamber and by carrying out additional runs for a longer duration. After coating deposition of the aluminum conversion layer, the specimens were heat-treated - firstly at a low temperature, ~400°C, to form an alumina layer on the surface and then at a high temperature, 700°C, to diffuse the remaining Al into the Ti to form a titanium aluminide. The aluminum conversion layer may be deposited on the titanium-based substrate at a temperature of less than about 450° C.

Please amend paragraph [036] with the following amended paragraph:

**[036]** The tensile strength of the specimens was determined using standard equipment. The thin coatings of around 10µm gave strengths similar to those of the uncoated material, while the thicker coatings decreased strength, despite the reported very high strength of TiAl compared to conventional titanium alloys as shown in FIG. 1. (For the graphs in the Figures, curve fitting has been used to add ~~treadlines~~ trend lines in order to better understand and illustrate the data. The ~~treadlines~~ trend lines were plotted using least squares fit. ~~The type of equation which gave the best fit is indicated on the graph, plus the~~ The R squared value indicated on the graph ~~which~~ shows the closeness of the ~~treadlines~~ trend-lines fit to the data, with a value of one being the best possible fit.)

Please replace paragraph [041] with the following amended paragraph:

**[041]** At ~~lower~~ higher temperatures, X-ray showed a mixture of titanium aluminides ~~aluminides~~ are formed, but at ~700°C and below only TiAl<sub>3</sub> was present plus a significant amount of alumina.

Please replace paragraph [044] with the following amended paragraph:

**[044]** The tensile strength (FIG. 3) shows an increase as the temperature drops ~~from~~ from 700 to 640°C, and it then remains relatively constant. The fatigue strength increases as the temperature decreases, surprisingly continuing to increase at the same rate even when the temperature drops below 660°C. In fact, the increase in fatigue life as the temperature falls below 700°C is surprisingly greater than would be expected from the increase in tensile strength (FIGS. 4-5). Comparable

good oxidation resistance was found for all the heat treatment temperatures below around ~~around~~ 700°C.

Please replace paragraph [045] with the following amended paragraph:

**[045]** It was also surprisingly found that if the diffusion temperature of the coating on the metal substrate was below the melting temperature of the Al, diffusion into the Ti still occurred, provided the coating process produced a good clean bond between the part and the coating. In Fig 6 a micrograph is shown for a relatively thick ~~~42- $\mu$ m~~ 12  $\mu$ m Al coating (to better show up the Al coating) that has been heat treated at a temperature below the melting point of Al. A very thin diffusion- or bond layer can however still be seen between the Al layer and the Ti despite the low temperature. At higher temperatures, above the melting point of Al, the outside surface is denser and more clearly defined than in Fig. 6, and the alumina layer is more clearly visible. The micrograph of Fig. 6 shows both surfaces of the Ti foil to illustrate another advantage of the thin Al layer herein described. Thicker layers it can be seen would effectively be comparable in total thickness to the Ti foil, which ~~of course~~ is undesirable from the point of view of heat exchanger design ~~exchanger's designer point of view is undesirable.~~